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Main Article:

Intuition as an Expression of Procedural Knowledge and its Association With Sense-Impressions: Illustrations From Winemaking Practice

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Abstract

The article explores the intuitive element of procedural knowledge in winemaking. It presents data on winemakers' interpretation of intuition, specifically its relationship with sense-impressions and experience. Interviews were conducted with six winemakers and two winemaking consultants in South Africa. Four insights on intuition emerged from the interviews. According to the first, intuition is similar to artistic inspiration, the unique and subconscious flow of ideas and approaches that characterize creative instinct. The second insight emphasizes the role of the senses in knowing intuitively, and calls for an examination of the relation between intuition and the senses. The third insight views intuition as immediate knowledge that springs from a link between past experiences and current events. In the last, intuition is seen to occur when all the facts of a matter are considered and the missing pieces of the puzzle are filled in by sensory assessments.

Index Terms: experiential knowledge; gut feeling; intuition; knowledge store; personal knowledge; procedural knowledge; sense-impression; winemaking

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1. Introduction: Knowledge and Intuition

The aim of this article is to explore the intuitive element of procedural knowledge and its association with sense-impressions in the context of winemaking practice. Procedural knowledge is a key component of a practitioner's "knowledge store," where the latter concept refers to:

> a dense set of personal knowledge made up of procedural knowledge (parts of which are tacit), factual knowledge, potential factual knowledge and opinions; the totality of which is continuously refined and expanded through experience and external information picked up from people, documents or events. (Boshoff, 2014a, p. 8)

Personal knowledge—or the total sum of a practitioner's implicit and explicit knowledge—is seen as a broad category of knowledge that comprises other kinds of knowledge, including procedural knowledge. Procedural knowledge is "an intimate and automated expression of personal knowledge, representing that part of personal knowledge which is internalized and habitually performed in practice" (Boshoff, 2014a, p. 8). Procedural knowledge is knowledge-in-action, and refers to skills and abilities that are demonstrated in practice through the performance of procedures. Closely related to procedural knowledge is experiential knowledge, or knowledge that is derived from personal observations and experiences, typically of past successes and failures. Factual knowledge refers to claims that are supported by the best of currently available scientific research. Potential factual knowledge, on the other hand, refers to claims that could be either factual or opinion-based but a verdict is lacking for three reasons:

(a) the claim has not yet been subjected to scientific research;
(b) scientific research was conducted into the claim but has generated mixed results—some findings support the claim whereas others contradict it; or
(c) although relevant scientific research was conducted, the findings are sitting somewhere in the world's vast pool of research literature and have not yet been linked to the claim.

Another knowledge type, opinion-based knowledge, describes claims that have already been assessed in terms of scientific research and for which no supporting evidence was found.

Claims that represent factual, potential factual, or opinion-based knowledge are codified, which means that they are articulated as statements. Such claims either enter the knowledge store from outside (external) or arise from within (internal). An external knowledge claim enters a practitioner's knowledge store through different communication modes (e.g., conversations with others or engagement with published materials). Often a practitioner's store of personal knowledge, specifically the internalized procedural and experiential knowledge component, acts as a standard for judging and immediately knowing whether an external claim has any merit or not. An example is the winemaker who only trusts new information when "it coincides with your gut and with your intuition also" (Boshoff, 2014b, p. 13). Moreover, any external claim that enters the mind of a practitioner and of

which a memory is stored—either consciously or subconsciously—will become part of the knowledge store.

Claims representing factual, potential factual, or opinion-based knowledge also emerge from within the knowledge store. Essentially, it means that part of a practitioner's procedural knowledge is made explicit. This is the case when a practitioner articulates a rule for knowing how to skillfully perform a certain procedure in a given practice situation. However, not all procedural knowledge can be made explicit. Some parts, known as tacit knowledge, will always escape codification as these are impossible for the bearer to reflect on and to articulate (Boshoff, 2014a).

An underlying tacit dimension is therefore a defining feature of procedural knowledge. Tacit knowledge refers to knowledge that is implicit and not stated (Welsch & Lyons, 2001). Polanyi (1966) alleges that not all knowledge can be explained—his famous quote, "we can know more that we can tell" (p. 4)—although it can be communicated in some way if one is provided with adequate means of expression. An example used by Polanyi is that of instant face recognition. It is impossible to explain how one recognizes someone else's face among a crowd of others, yet, should one be instructed to reconstruct that face on the basis of a pool of facial clues, one most likely would be able to communicate what facial clues to connect to produce the required image. To use an example from winemaking practice: by tacitly knowing a certain appearance of grape juice and the concomitant intervention, a winemaker attends from the situational clues (proximal) to the diagnosis (distal) without always being able to specify the signs responsible for that immediate knowledge. Thus, it is the signs or rules of knowing (proximal) of which the winemaker possesses tacit knowledge. Although Polanyi leaves room for the fact that the underlying rules of knowing can be made explicit (expressed as propositions), he is adamant that the formulated rules can never replace the procedural knowledge that is demonstrated by the skillful performance:

> Rules of art can be useful, but they do not determine the practice of an art; they are maxims, which can serve as a guide to an art only if they can be integrated into the practical knowledge of the art. They cannot replace this knowledge. (Polanyi, 1958, p. 50)

Apart from the tacit dimension, procedural knowledge also involves an intuitive element, as the actions resulting from such knowledge lack analytical reasoning and are based on ability to "sense." Sahdra and Thagard (2003) define procedural knowledge as the "intuitive recognition of the patterns of one's environment that are the most relevant for making a decision or acting appropriately" (p. 491). Loye (1983, in Rew, 1988) distinguishes between three kinds of intuition. The first, precognition, refers to knowledge that something is about to happen without any past or present clues supporting that conclusion. The second, cognitive inference, characterizes situations where conclusions are almost spontaneously reached because the steps involved are happening so fast and subliminally that the person is not even aware of engaging in an analytic reasoning process. In Gestalt intuition, the third kind, the person perceives the whole and can therefore spontaneously detect gaps and deficiencies.

Welsh and Lyons (2001), in the nursing sciences, postulate a link between intuition, tacit knowledge, and formal knowledge. Tacit knowledge for them is the result of the synthesis of formal knowledge (e.g., training received) with clinical experience. Tacit knowledge, in turn, informs intuition and for that reason is positioned between formal knowledge and intuition. Thus, whenever an intuitive decision is made, some element of formal knowledge is also being used, albeit indirectly. In effect, the discussion by Welsh and Lyons suggests two forms of intuition: that which is based on the acquisition of formal knowledge and that which occurs without any reference to a formal knowledgebase. The first is deemed acceptable and the latter, in the authors' opinion, "has no place in professional practice" (Welsh & Lyons, 2001, p. 305).

Another take on intuition is that it stems from a process of pattern recognition based on past experiences, or the categorization of new objects in terms of objects that one already is familiar with from past experiences. Norman, Young, and Brooks (2007) discuss two broad theories that explain the process of mental categorization. According to prototype theory, a practitioner's experiences with exemplars of a particular category will result in the formation of an abstract prototype that reflects the critical features of that category. When confronted with a new object, the practitioner compares the features of this unfamiliar object to those of all prototypes stored in memory to determine to what category the new object belongs. In exemplar theory, on the other hand, a category is represented by its individual exemplars and not by an abstract prototype. Thus, there is no apparent feature-by-feature analysis. A new object is holistically matched to all stored exemplars to determine the appropriate category to which it belongs. This normally occurs because of a wealth of past experiences where there is a sufficiently large pool of exemplars already stored in memory. Hence, experience leads to a more comfortable use of intuition, and confidence in intuition also coincides with expertise (Chaffey, Unsworth, & Fossey, 2010).

From the perspective of the skilled practitioner, the intuitive aspect of procedural knowledge is rarely given any thought as the instantaneous performance of an appropriate procedure is seen as common sense. Anthropologically speaking, common sense means that certain quasi-qualities are assigned to reality (Geertz, 1983). These include *naturalness* (the procedure that is spontaneously applied by the practitioner represents the way things are), *practicalness* (any action other than the applied procedure would be impractical), and *thinness* (there is nothing more to the procedure; it is what it is). The intuitive and common-sense aspect of procedural knowledge also manifests as gut feelings. Stolper et al. (2009), for example, identify two types of gut feelings that are derived from focus-group discussions with general practitioners: a sense of alarm and a sense of reassurance. A sense of alarm involves three elements: (a) an uncomfortable feeling that something is wrong even though the practitioner cannot find indications to objectively verify the feeling, (b) a distrust of the situation because the prognosis appears to be uncertain, and (c) an urgent need to intervene to avoid an adverse problem. A sense of reassurance, on the other hand, is experienced as a secure feeling—the appropriate intervention is clear in the mind of the practitioner even in the absence of a proper diagnosis. For experts, gut feeling is inextricably linked to knowing in practice, as voiced by one respondent in the study by Stolper et al.: "At a certain moment, it becomes a

matter of knowing, this gut feeling of alarm or reassurance, you just know" (Stolper et al., 2009, p. 5).

In the light of the above discussion of procedural knowledge, the present study aims to further the understanding of procedural knowledge in practice by presenting data on winemakers' interpretation of intuition, and specifically the relationship between intuition and sense-impressions and experience. The context is winemaking practice in South Africa, and interview data will be presented.

First, though, brief reference will be made to the increased "scientification" of winemaking, and the critical role that procedural knowledge and intuition continue to play in such a changing environment. The section also provides the rationale for selecting winemaking for a study of procedural knowledge.

2. Increased Scientification of Winemaking and the Persistence of Procedural Knowledge

Grapes are the raw materials for wine and vinification is the process of converting grapes into wine. The process varies according to the kind and style of wine to be achieved, with the difference between white and red wine an obvious point of variation, as is illustrated simplistically in Figure 1.

Winemaking is a process with ancient roots, but its scientific foundation only became known around 1863 when Pasteur conducted his work into microbial activity, which showed that yeast is the primary catalyst in wine fermentation (Pretorius, 2000). Giuliani (2007) portrays the history of wine production as comprising two phases. On the one hand is the "old" quantity-orientated phase, which was primarily concerned with the production of standard wine, often sold as bulk wine. On the other hand, the last few decades represent a "modern" or quality-orientated phase, characterized by a shift away from standard wine towards fine and premium wines that increasingly incorporate scientific and research advances in winemaking practice. This is particularly the case for the so-called "new world" wine-producing countries (i.e., Argentina, Australia, Chile, New Zealand, South Africa, and the USA), although to different degrees.

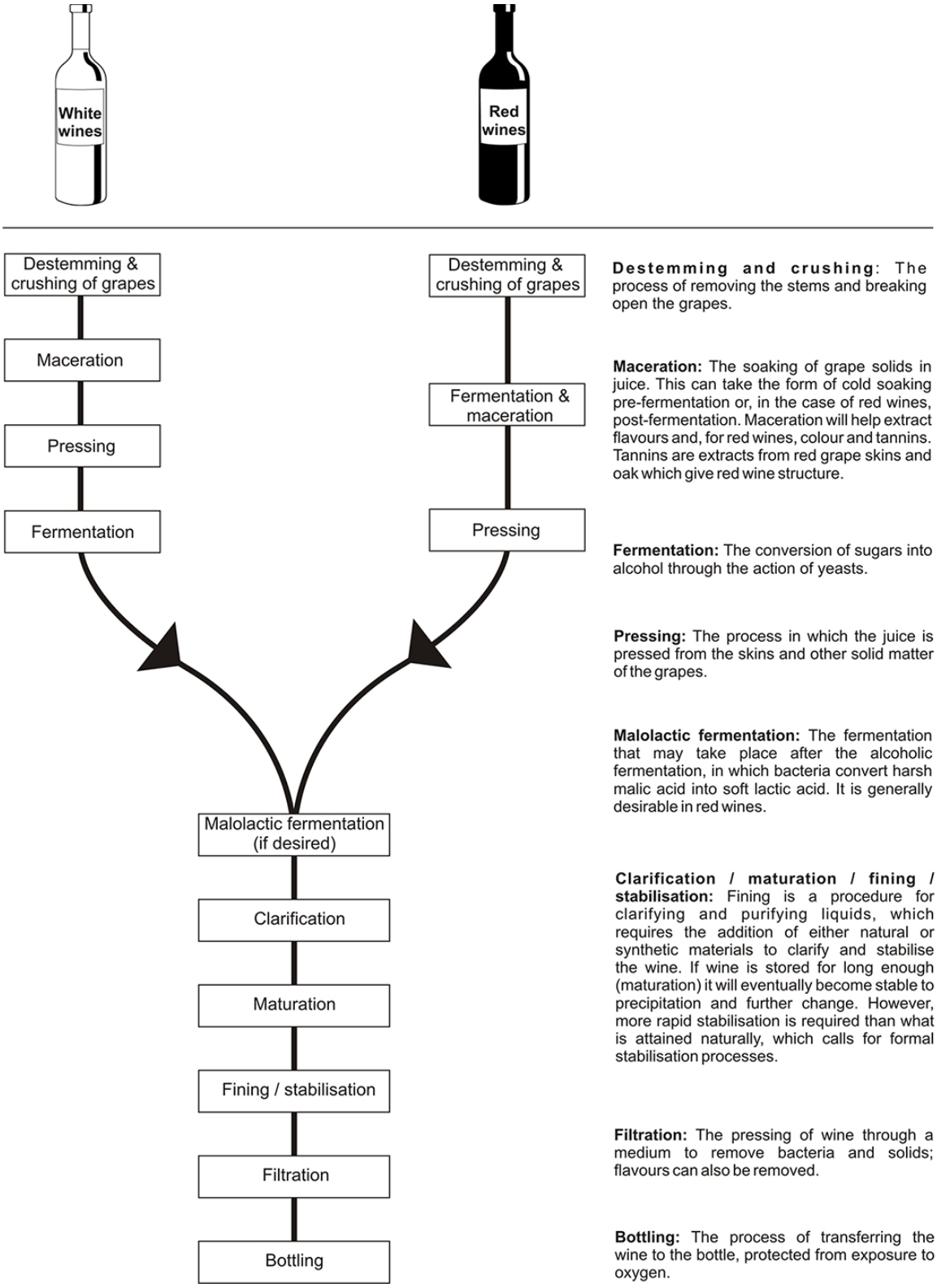

Figure 1. Steps in winemaking.

Source. The flow diagram is adapted from Pretorius (2000). The explanations are taken from Grainger and Tattersall (2005) and Rankine (1989).

In the current quality-orientated phase there is a strong emphasis on codified knowledge (i.e., knowledge that can be articulated and hence be made public to inform the development of new technologies). Increased codification, according to Giuliani (2007), should be seen together with the increased "scientification" of winemaking that is characterized by three developments: first, the emergence of scientific explanations that demystified many aspects of grape-growing and fermentation; second, the emergence of recipes for winemaking that provided appropriate codes of conduct to achieve certain outcomes; and, third, the adoption of devices and machinery designed to automate a number of winemaking processes.

According to Giuliani (2007), the increased codification of the quality-orientated phase does not mean that tacit knowledge—portrayed in the current study as an element of procedural knowledge that is intrinsically linked to intuition and sense-impressions—has now suddenly become obsolete. Giuliani illustrates the persistence of tacit knowledge by means of some examples. For instance, fermenting wine has to be tasted during the making of red wine in order for a winemaker to determine how long it should be kept fermenting on the grapes' skin. Similarly, it is often essential for wine to breathe through the oxygenation of yeasts and a typical smell would indicate to a winemaker the need for oxygenation.

Thus, in the quality-orientated phase of wine production, procedural knowledge and its practice manifestations actually gained in importance "supporting the generation of new knowledge, complex decision taking and operational routines" (Giuliani, 2007, p. 148). Therefore procedural knowledge warrants closer study as it supplements the operations and new technologies that are part of the increased scientification of winemaking.

3. Methodology

This article is part of a larger study about the use of scientific research in South African winemaking, which mainly involved an online survey of 211 winemakers regarding their knowledge sources and the extent to which they use the findings of scientific research. The results of the survey have been published elsewhere (Boshoff, 2014a, 2014b). The current article reports on the semi-structured telephone interviews that were conducted with winemakers as a follow-up to the survey.

Three criteria were used to select interviewees:

(a) winemakers who rated "intuition/common sense/personal knowledge" (a close-ended survey item requiring a five-point rating scale) as an extremely important source of knowledge in their winemaking;
(b) winemakers who strongly agreed with the statement that scientific research findings have led them to do something different in their winemaking; and
(c) winemakers who expressed a willingness to talk in more detail about their winemaking and hence provided contact details in the survey.

Twenty eight of the 211 respondents met all three criteria. Ten winemakers were selected from the 28, using sex, age, cellar type, and geographic region as stratification variables. Of these, six winemakers granted permission for an interview. In addition, interviews were also conducted with two more individuals: a winemaking consultant who was also a winemaker and who regularly engages with other winemakers in an advisory role, and an oenologist who was contracted by a service organization for wine producers to render research-informed advisory services to winemakers.

The interview schedule was inspired by questions used by Stolper et al. (2009) in their focus groups to explore the determinants of gut feelings of general practitioners. In the current study, similar questions were formulated to explore the nature and conditions of intuitive knowing as an expression of procedural knowledge in winemaking. There were eight questions:

(a) "Do you sometimes get a gut feeling/intuitive sense of what to do when making wine?"
(b) "When does this tend to happen—what stage, what process?"
(c) "What normally happens when you get the gut feeling/intuition?"
(d) "How do you deal with this?"
(e) "What cues normally trigger your intuition?"
(f) "To what extent do you think this is influenced by professional experience?"
(g) "Do you trust your gut feelings?"
(h) "Do you trust it more than you trust other sources of knowledge?"

Each interviewee received an e-mail request for a telephone interview. All the interviews were digitally recorded and transcribed verbatim. The transcripts were then analysed to identify recurrent themes and extract text to illustrate those themes. The themes were subsequently linked by constructing a narrative that incorporates insights from the relevant literature.

4. Results and Discussion

Four themes emerged from the interviews. According to the first, intuition is similar to artistic inspiration. The second insight emphasizes the role of the senses in knowing intuitively, whereas the third portrays intuition as immediate knowledge that springs from a link between past experiences and current events. Lastly, intuition is seen to occur when all the facts of a matter are considered and the missing pieces of the puzzle are filled in by sensory assessments.

4.1. Intuition as Artistic Inspiration

Artistic inspiration refers to the unique and subconscious flow of ideas and approaches that are characteristic of creative instinct. Intuition as a form of artistic inspiration, in the context of winemaking, implies that the practice of winemaking is both a science and an art, given that such inspiration is often synonymous with the skilful performance of an artist:

> Why I decided to swot oenology is because it really is the point where science and art interact. You cannot say to a guy, take this paintbrush and these bits of paint and, say, listen, now you must paint this scene because you cannot really tell him which colours . . . he will leave his own imprint or many times he'll impress his own personality on the wine. So you get your raw products, you get barrels and stainless steel tanks and the grapes and wherever you would go and buy it from, but the manner how you apply your techniques and the way you approach the grapes many times will become almost part of your personality. So that intuition, most of us more or less have very good background knowledge as to how to make wine, the basics we know, but how you actually connect the things . . . that is very much internal. (Winemaker 1)

Background knowledge together with products and materials comprise the "building blocks" of winemakers in the same way that paints and brushes comprise the tools of the artist. The way that everything is brought together to achieve the end-product (wine in this case) occurs intuitively, with the result that wine becomes an expression of the winemaker's personality.

Four elaborations are warranted. First, technical and physically available "building blocks" are not the only building blocks involved, or at least not the main ones when it comes to artistic inspiration. Second, artistic inspiration means that one perceives an imaginary concept in the inner world and then intuitively reconstructs that imaginary state in the physical world as a symbol of one's inner feeling (Eisner, 1972). Third, the building blocks of winemakers in the case of artistic inspiration also include the sense modalities. According to Eisner (1979, p. 14), concepts are formed in the imagination through "the content provided by each of the sense modalities" and the translation from an imaginary concept to an image of reality is "made possible by what the visual, auditory, and the other sensory modalities provide." Fourth, the winemaker-as-artist cannot be separated from the winemaker-as-connoisseur, as connoisseurship relies on anticipatory schemata to structure, filter, and interpret the content provided by the sense modalities:

> Connoisseurship is the art of appreciation. It is the result of having developed a highly differentiated array of anticipatory schemata that enable one to discern qualities and relationships that others, less well differentiated, are less likely to see. (Eisner, 1979, p. 14)

The artistic inspiration at work in the creation of good wine thus also implies the art of appreciating the object of creation as it unfolds. In this sense, connoisseurship is an intuitive skill as it "works its results in practice" but lacks "both a comprehensive statement of method and a rationale for that method" (Ebitz, 1988, p. 209).

4.2. Intuition as Knowing Through the Senses

The second insight concerning intuition, which links to the above and emphasizes the role of the senses in knowing intuitively, needs to be treated carefully. Knowing through

sense-impressions is not only considered a form of implicit knowledge but, according to others (e.g., Pears, 1971), also a different type of knowledge altogether. Knowledge of general things, like colour, taste, smell, and texture, which point to the state of things, constitutes for Pears a form of knowing that can best be described as acquaintance. According to Pears there is some connection between acquaintance and factual knowledge, as being acquainted with the state of things on the basis of certain sensations implies additional information about the object of acquaintance. When making an inference about the state of the wine-in-making on the basis of a visual or olfactory sensation, some piece of factual knowledge also comes to mind, for instance, that some aspect of the wine, when measured, will lie outside acceptable boundaries. Intuitive knowing is a process whereby the state of affairs is instantly recognized on the basis of implicit and subconscious knowledge of the underlying particulars.

Also, the human senses and the act of knowing are performatively interrelated. Awareness of a particular sense-impression and implicit knowledge are part of the "same moment," so to speak, with the effect that the sense-impression and concomitant knowing can neither be seen nor experienced as separate. In Polanyi's (1966) terminology, through the senses, the winemaker has immediate recognition of the distal (the state of affairs) without having conscious awareness of the proximal (the particulars or rules that guide the diagnosis of the state of affairs). A different take on Polanyi's image of moving from the proximal to the distal, according to Cannon (2002), is that the sensory features operate as the proximal and the recognition of the state of affairs as the distal. Although the subject is consciously aware of the sensory features, it is the relation between the proximal and distal that is implicit and which can or cannot be made explicit. Cannon also views sense-perceptions as clues to joint meaning, and presents the stretch between the "from" (proximal) and the "to" (distal) as a tacit stretch, a form of instant relational contact with the reality that is being perceived:

> Sensory appearance is a genuine appearance of the object, not separate from or additional to it but a co-relation of a perceiver to it and it to a perceiver. It is an access to the object that is finite, limited, and to some extent coloured and shaped by (1) the perceiver's perceptual placement and orientation with respect the object, (2) the perceptual capacity of the perceiver, (3) the acuity of the perceiver's sense organ(s), (4) the attention of the perceiver, etc. But on Polanyi's account, the perceiver is not on the hither end of a causal chain of events stretching from the object to her brain, trying to imagine and infer what must have produced these effects. Rather, the perceiver goes right up to the object perceived, touching it, exploring it, examining it, indwelling it. (Cannon, 2002, p. 34)

The following quotes provide examples of a winemaker immediately recognizing the state of affairs when experiencing the particular sense-impression, almost to the extent of "indwelling" it, resulting in the winemaker also knowing how to proceed:

> When I walk into the cellar in the morning I often smell the cellar. It is the smell of the cellar that will tell me if there is a tank with a problem. Then I

> need to find which tank it is and normally I know the smell and know what it needs. Usually it will be a nutrient inefficiency. . . .
>
> One can look at the wine, even before you test it you can tell whether it's got a high pH, like if I look at a wine . . . it's not always like it but a lot of time, if I look at the wine and it's got a slight touch of mould in it for a young wine, I know it's going to have a high pH. I'm pretty sure if I did a pH on it, it's going to be up near 4. And as soon as that happens then I realize I need to give it more sulphate. . . .
>
> A big indicator for me is when I see my red grapes been poured into the tank. How the red, the pigment, stains the sides of the tank. If it doesn't stain at all, you know you've got a difficult year for colour. If it makes a red sort of, you know, sort of stain on the side of the tank, you know it is a good year for colour. And I think colour is, specifically in red . . . in white as well . . . colour is crucial, it's so important, that healthy colour. If I'm looking at a person, if you can see they look healthy and fit, you know, they're not gonna give you any [trouble] . . . a sickly kind of person, you know, they're not gonna last . . . The appearance of a wine, I'm afraid, for me it is vitally important. That good, rich, deep sort of red colour in a red and then a nice green for young white, that green pinch I always think is a very good sign. (Winemaker 2)

Sensory perceptions, as a way of knowing by acquaintance, are thus "vehicles for providing the content for knowing" (Eisner, 1979, p. 13) as part of an act where there is no boundary between perception and knowing. Such intuitive knowing, as stated above, can also be seen as a process whereby the state of affairs (the distal) is instantly and consciously recognized on the basis of implicit and subconscious knowledge of the underlying particulars (the proximal). Although the proximal, or the rules of knowing, is implicit, it can sometimes be reflected upon and expressed as propositions. Once implicit knowledge can be verbalized or expressed in one's mind as propositions, it has the potential of being codified and thus becoming explicit knowledge. The following quote involves a situation where an experienced winemaker was asked by a younger winemaker to explain the underlying principles of immediate knowing on the basis of sense-impressions. The experienced winemaker could verbalize the signs or rules of knowing:

> My [elderly family member who is also a winemaker], for instance, would pass a tank and then he would say, listen, this tank has a problem. And then I would ask, how do you know that, and then he would respond that these and these and these are the signs. (Winemaker 3)

However, there are also instances of knowing intuitively (through the associated sense-impressions) where the underlying rules of knowing cannot be verbalized. In such instances the implicit knowledge remains inherently tacit.

> When it comes to the finer things, you really cannot tell someone, okay, good, this is why so and so. You just had a sensing at a particular moment,

> yes, this might work better and it will be based on knowledge that you've already had or things that you've already experienced or people that you've already spoken to . . . So it is not an airy fairy kind of thing. It's definitely based on knowledge but some people's knowledge may not necessarily be the same as yours. (Winemaker 1)

For one interviewee, intuition needs to be scientifically justifiable in order to produce wines that meet basic criteria of quality ("fantastic wines"). They nevertheless admit that intuition without scientific foundation (such as "picking on feel") exists, but only in the few instances where quality is determined by the eccentricity of the winemaker, as is the case with some top-end wines (Ponte, 2007).

> What I don't believe in, and this is actually quite important . . . I haven't got a problem with picking on feel. There are people doing that. I know a guy [in another new world wine country] doing that, but he's only making top-end wines where he can afford to make blunders and mistakes. But I don't believe on picking on a hunch or a gut feel when it comes to sugar levels and things like that. That is pure fantasy and, you know, there is no room for that . . . If you are not technically or chemically based, I don't believe you can actually make the most fantastic wines. (Winemaker 4)

However, some interviewees were not convinced that winemakers really rely on intuition, as they believe that intuition springs from an underlying knowledge base that incorporates experience. They even doubted whether the word "intuition" captures the essence of the process of instant recognition and implicit knowing. For them, it is more the case of a reinforced link between past experiences and certain sense-impressions which results in sharpened senses. Thus, instant recognition occurs where a close association has been established between a past event and a sense-impression, and if the winemaker now smells, sees, tastes, or feels that very same thing in the present, it will remind him/her of the corresponding event in the past. In the words of the oenological consultant, the moment the connection is made, "little bells will start ringing inside you." What this interviewee is referring to, is a personal sense of either alarm or reassurance that constitutes a gut feeling, and which arises from a dense network of similar experiences (Stolper et al., 2009).

> A few basic things pertain to winemaking, a few basic things such as your sense of smell. If you were to pick up some strange smell or a pleasant smell, little bells will start ringing inside you. There are one or two basic analyses, if you look at the analysis, then the analysis will tell you a few things. I think it is most probably that which winemakers tend to interpret as intuition. I don't think it is some sort of gut feel where they say, "Ah, I've got something here." There is something that makes them think they get the gut feel. So I think the word is a bit misused, but again, with experience, it is so that the more experience you have, the fewer of those things you need to arrive at a conclusion or to take a particular course of action without having doubt. I think the word intuition is a little bit diluted. (Consultant 1)

> It is from years of experience that one gets that intuition, in any stage of winemaking, from the beginning. I mean, if the grapes coming in are too hot, then you know you need certain steps because . . . past experience told you these and these problems will emerge . . . I think . . . it's less intuition and more past experience, knowledge, and transferred knowledge than anything else, in my personal opinion. And, additionally, it also has a lot to do with the senses. I mean, smell and taste, which can tell you . . . I mean, if you have a good sense of smell and a good sense of taste you can . . . You can say it's intuition but in fact it is just your sharpened senses. (Winemaker 3)

The above interviewee argued that knowing through the senses is not an example of intuitive knowing. To some extent their reasoning underscores the commonly accepted juxtaposition between intuition and the senses. Intuition is often seen as mysterious, non-scientific, speculative, and even irrational, whereas sensory perceptions are based on empirical reality and, for that reason, is regarded as scientifically acceptable.

4.3. Intuition as Instant Pattern Recognition

The third insight follows from an earlier notion that intuitive knowing involves a process of pattern recognition based on past experiences. Past situations are stored in one's memory as individual exemplars or some aggregation of exemplars, and new situations are continuously matched against these exemplars (Norman, Young, & Brooks, 2007). Thus, representations of past experiences form part of the knowledge store of winemakers. Winemakers unwittingly tap into this store when confronted with challenges in their winemaking. As a result, the different elements of a challenge are often instantly clear in the mind of experienced winemakers, as implied by the following individual who has more than 20 years of winemaking experience:

> If I sense a problem, 80, 90 per cent of the time I'll have a good idea why, from experience. (Winemaker 2)

Winemakers, upon reflection, also intentionally match aspects of their current situation to similar situations encountered in the past. In that way, recollection of past events can direct them to exhibit greater awareness, prevention and pro-activity in the present. Some winemakers interpret the insight sparked by the matching of past and present events as another instance of intuition:

> So I think experience has a big part to play . . . like the tank that tends to get stuck, often tends to be the same grapes each year. So your intuition would say, hang on, we won't want to look at those with [useless] yeast, we'll try maybe to give it a decent one to help it on its way. Your intuition would tell you to do that. (Winemaker 4)

> So it is experience, and I think it relates to experience over years, during which he [family member who is an experienced winemaker] has built that knowledge, that's why one gets that intuition . . . Or he would taste the wine and say, listen, you need to filter it immediately otherwise it is going to

> develop a problem. Then I would say but I still don't get any VA [volatile acidity] or other fault and he would say, no, just wait, you'll see. Then I would do the analyses, just to discover, it is busy picking up slowly. I think it is the result of years of experience. (Winemaker 3)

> Look every vintage is different. It is like watching a game of cricket or rugby. Same rules, it is the same game, but every game you watch is different. You can say it is a similar game to that or it is a similar vintage to that vintage . . . That's what I do as a winemaker. When the season starts, I said, "Okay, what is this season like? . . . Which years does it remind me of? Okay, in that year we had a problem with acids . . . so I must keep an eye on that." (Winemaker 2)

Normally the network of exemplars and inter-connective parts of knowledge becomes more dense and populated with experience (Stolper et al., 2010). If, for some reason, the elements of a new challenge cannot be successfully matched to anything similar within this dense network, either subconsciously or consciously, it can easily lead to confusion and strain, even among the most experienced winemakers.

> I've been making wine for 21 years now. So if something crops up and I don't know what it is and I can't work out why it happened, I get very nervous very quickly, and often I get desperate. (Winemaker 2)

So far we have elaborated on three insights pertaining to intuitive knowledge, namely that intuition is similar to artistic inspiration, that sense-impressions and intuitive knowledge are performatively interrelated, and that intuition springs from instant recognition of a link between previously and currently experienced events.

4.4. Intuition as Absolute Understanding

A fourth insight also emerged from the interviews, where intuitive knowledge—interpreted as instant recognition of the state of affairs and decision on how to proceed—results from the consideration of the relevant facts and the filling in of any blanks with sensorial assessments. Thus, sense-impressions, according to this perception, serve to complement available information and data. One winemaker clearly brings the point across:

> What your job is as the winemaker is to have absolute understanding . . . You've got all the information, the block that the vineyard is growing on, the rootstock, the clone, the aspects, the closeness to the sea, the terroir, the soil, the climate exchange . . . you know all of those things, what effects those things will have on the wine, okay . . . When you bring it in [the grapes] . . . you have an idea, maybe call it a hunch, but you have a pretty good idea of what it should be . . . It's still about having a recipe certainly, but it is trying to have as much information as possible. You know, you want as many pieces of the jigsaw to technically get what is possible and you need to fill in the blanks with the sensorial qualities . . . So, you need to

> have that information but you need to have as much backing as possible. That's really what I would say, otherwise you can't make the [best] judgement . . . It's like any profession. You have as much information as possible; you never have everything otherwise it would never be a decision . . . But you need to have everything to make that decision or as much as you can. . . .
>
> You are going to see very quickly what are the . . . traits, and of course, you have a very good idea already before you pick. . . . If you are doing that, and that's another factor, you know, if you're doing that, then you will have a good idea, and then you will get a gut feeling of what to do in the winery, yes. (Winemaker 4)

A similar insight is shared by the winemaker who renders services as a winemaking consultant:

> It could be intuition but it's also based on actual data. You should know what happened in your winter; you should know what happened in your spring. You know, things like how it affected budding, how it affected flowering, how it affected the actual formation of berries and the whole built up towards ripening, you know. Because that will all give you clues as to what you could expect and you might not . . . You know, you might not hit the jackpot, but you're going to be very close. (Consultant 2)

Having all the relevant facts therefore contributes to absolute understanding of the situation and of what is feasible, and acts as a springboard for intuition and gut feeling in the cellar. The relevant information is consciously gathered and registered at all stages, from the vine to the wine, and is also strongly related to an envisaged end-product. It is therefore not surprising that one winemaker, when asked during what stage intuition becomes most prominent, has no hesitation in linking the emergence of intuition to "day one":

> Day one . . . I almost want to say as from the day that the little stick is planted in the soil, the rootstock, clone, you know, those kinds of things . . . Look we know certain clones (it has been proven by research and also in practice) . . . generate certain aroma characteristics. So when you plant the vineyard you have a certain end-goal in mind . . . I mean, you're not just going to plant something for the sake of planting. You're going to plant it for a reason. Whether it is for brandy or for a top class Chardonnay, or whatever, you're planting it for that goal. And then you will select your soil, the location, et cetera, et cetera, you will do it all accordingly . . . And I think at the end of the day when you've planted it, when you have established it and you harvest your grapes, from that day onwards you should know in what direction it is going, and then you must try to steer it in that direction, if I can put it that way. (Winemaker 5)

The above quote, with its reference to "steer it in that direction," is voiced by a winemaker who is both a rationalist and strategist, as the vinification process is steered towards some ideal. In that context, the winemaker regularly assesses the condition of the wine-in-the-making. Decisions are taken to close the gap between the actual condition and the ideal reflected in a set of parameters defined prior to the harvest based on information from previous years. Sense-impressions, as stated in a previous quote, can "fill in the blanks" and, specifically in this broad context of application, provide an indication not only of the extent that the wine-in-the-making deviates from the ideal, but also what direction the wine should be taking:

> You need to look at the colour of the grapes and if you have smaller berries—specifically with red—smaller berries with a dark colour, then you know you're gonna get a more prominent colour and aroma extract. So that will give you an idea of what to do with it later on . . . how long skin contact should be . . . if you're going to put it in barrels at a later stage, ferment it with chips or whatever. You know, those things [the sensorial features] will give you an indication of what to do. (Winemaker 5)

The above quote, focusing on the colour and size of grapes at the time of harvest, provides an example of how sensorial assessment can fill in the missing pieces of the puzzle, thereby creating a dense network of knowledge. This dense network not only informs the process of vinification but also generates instances of intuition.

5. Concluding Remarks

This article deconstructed intuition in terms of four themes that are not mutually exclusive. "Sense-impressions," "senses," and "sense modalities" are notions that run across all four themes and which dominate discussions of elements that are at play in the formation of intuition in winemaking. Such elements include experience, artistic inspiration, pattern recognition, and an imaginary ideal, to mention a few. In the same way that the senses and intuitive knowing are performatively interrelated, intuition does not exist independently of these elements.

Something also needs to be said about the pragmatics of intuition for winemaking. Winemakers seldom have the luxury of time to deliberate on each and every decision. It is the same in clinical practice where the medical practitioner is confronted with a number of client symptoms on a daily basis. Quick decisions need to be made. Such diagnoses in clinical settings are often reached on the basis of intuition and sense-impressions (e.g., a sense of alarm indicating that something is wrong). In that way a reliance on intuition helps with the management of complex situations, as well as assisting the practitioner to effectively get through the day (Stolper et al., 2009).

> In a cellar . . . you are pretty rushed . . . you make pretty quick decisions and then you sort of back it up when you've got more time, [when] you're testing it, getting samples . . . (Winemaker 2)

The quick decisions based on intuition and sense-impressions are tapped from a winemaker's knowledge store, which, among others, involves experience and a collection of knowledge that was gathered from different sources, either consciously or subconsciously. The different sources can fulfil a dual role in relation to a winemaker's knowledge store. On the one hand, they can supplement and "tighten" a winemaker's already dense network of personal knowledge. On the other hand, they can serve as an aid, given that additional (external) knowledge is deliberately sought in instances where a winemaker's personal knowledge appears insufficient to effectively deal with a particular situation or problem.

Also, winemakers have their own mental model of how their world of work operates. Any incoming information is interpreted within the boundaries of the mental model, whether and how it fits the model, as well as how practically relevant the incoming information is against the backdrop of that model. The order of the use of knowledge sources by winemakers occurs in relation to the mental model and is best understood with reference to a three-fold typology by Boerkamp et al. (Boerkamp, Haaijer-Ruskamp, Reuyl, & Versluis, 1996). The first is habitual decision-making where a practitioner makes a decision without considering any alternatives. The second is decision-making based on an internal search, where the practitioner makes a choice by using knowledge from her or his memory. The third is decision-making based on an external search, where a variety of information sources can be used. Although habitual decision-making is subconscious and decision-making based on an internal search mostly conscious, both are grounded in a winemaker's store of personal knowledge. It is especially with regard to habitual decision-making that personal knowledge—and more specifically procedural knowledge—can find expression as a skill that "dwells in" the winemaker, given that procedural knowledge is "physically stored in the hands and minds of practitioners" (Eyferth, 2010, p. 202). Procedural knowledge sparks moments of common sense, gut feeling, and intuitively knowing in everyday practice.

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